Rapid Scour, Sand Rim Construction, and Basin Migration of a Carolina Bay in Southeastern North Carolina

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Abstract

A terrestrial LiDAR survey of Herndon Bay in northeastern Robeson County, South Carolina, was conducted to examine rapid bay sand rim scour and construction. The project was carried out as part of a larger study of Carolina (or Old) Bays in the southeastern United States. In addition to LiDAR, we collected a suite of data in the field, including single-grain OSL samples, DTM-based elevation profiles, Geoprobe core transects, and ground-penetrating radar (GPR) transects. We used the Survey123 app for ArcGIS to collect field data with a Trimble R10 GPS device. We also used a Trimble Geoprobe® GSS150 for soil sampling and a Geophysical Survey Instruments Geoprobe® basic model for in situ GPR data collection. Furthermore, we collected single-grain luminescence samples for grain-size analysis at the University of Washington. Our research team was comprised of Tim Mylroie, Lance Smith, Jim Smith, Dan Clason, Dan Almond, and Christopher Moore. We also thank David J. Mallinson and Jim Smith for assistance in the field; Peter R. Parham, Andrew H. Ivester, and James K. Feathers for assistance in sample collection and analysis; and Christopher D. Smith for geophysical data collection. Our findings suggest that rapid bay sand rim scour and construction can occur over time scales of weeks to months, allowing for the accumulation of significant volumes of sand within a relatively short period.

Objectives and Methods

Our objectives were to use LiDAR and field data to examine rapid bay sand rim scour and construction. We collected data at Herndon Bay using a combination of LiDAR, GPR, and Geoprobe core transects. We also collected single-grain OSL samples for grain-size analysis. Our methods included the use of the Survey123 app for ArcGIS to collect field data with a Trimble R10 GPS device, and a Trimble Geoprobe® GSS150 for soil sampling and a Geophysical Survey Instruments Geoprobe® basic model for in situ GPR data collection. We also collected single-grain luminescence samples for grain-size analysis at the University of Washington.

Study Area

Herndon Bay is located in northeastern Robeson County, South Carolina. The bay is an example of a Carolina (or Old) Bay, a type of depositional feature that is common in the southeastern United States. Carolina Bays are believed to have been formed during the last glacial period, when the landscape was significantly different from today.

Discussion

Our findings suggest that rapid bay sand rim scour and construction can occur over time scales of weeks to months, allowing for the accumulation of significant volumes of sand within a relatively short period. This highlights the dynamic nature of these features and the importance of continuous monitoring to understand their evolution over time.